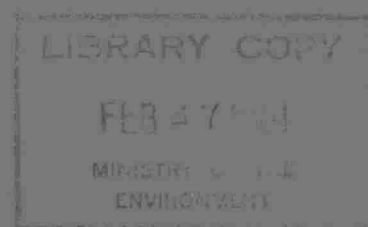


DEFINITION OF THE
NANTICOKE INDUSTRIAL
INFLUENCE AREA

June 1980



Ontario

Ministry
of the
Environment

The Honourable
Harry C. Parrott, D.D.S.,
Minister

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June 1980

DEFINITION OF THE NANTICOKE INDUSTRIAL INFLUENCE AREA

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1. INTRODUCTION

Construction and operation of a major industrial complex is currently underway at Nanticoke, 50 km southwest of Hamilton on the north shore of Lake Erie. The major industries involved are the Stelco steel mill, the Texaco oil refinery and Ontario Hydro's thermal generating station.

The Draft Official Plan for the Haldimand-Norfolk Planning Area recognizes that this complex should be surrounded by an approximate 3 km buffer zone, designated as the "Industrial Influence Area". In this area residential development will not generally be permitted, in order to limit exposure to "nuisance" industrial emissions, especially dust, odour and noise. Recommendations for such a buffer zone have been made at various stages in the planning of the area.

This report outlines the rationale to define the Industrial Influence Area around the major industries in the City of Nanticoke. The report provides a basis for identifying and implementing through specific policy statements the Industrial Influence Area in the Nanticoke District Plan and through application of other land use instruments.

2. RATIONALE FOR A BUFFER ZONE

Where industrial operations are located near heavily populated areas, air quality is an important issue. With pollution control technology advanced to current levels, pollution sources have controls which limit the resulting concentration of pollutants at the receptor to below a significant effects level. For specific pollutants, such as sulphur dioxide, or particulate, objective requirements can be fixed, because significant effects on humans, plants and animals can be quantified.

The legal instrument used by the Ministry of the Environment (MOE) to control emissions of air-borne contaminants at the source is Ontario Regulation 15, issued under The Environmental Protection Act, 1971. This Regulation establishes a procedure for estimating maximum pollutant concentrations at any point of

reception, using stack parameters such as height and diameter and meteorological factors so that appropriate air pollution control devices can be determined. The concentrations known as point of impingement concentrations are then compared for compliance to the standards set out in the Regulation.

Industrial air quality control at Nanticoke is supported by an extensive air quality and vegetation injury and damage monitoring network under the Nanticoke Environmental Management Programme (NEMP). NEMP is a joint government-industry venture to monitor current and future levels of air pollution in the Nanticoke area. The monitoring program will provide data on whether the Province's air quality criteria are being met. If air quality proves to be unsatisfactory, additional control requirements will be imposed on the sources. NEMP carries out three activities: routine pollutant monitoring, including real time monitoring; special studies related to air quality; and, mathematical air quality modelling.

Ministry experience elsewhere with industries of the kind at Nanticoke indicates that even while such operations comply with air emission standards, numerous complaints are received from residents living in proximity to such industries. These complaints can result from annoying day-to-day industrial operations and fugitive sources, such as truck loading and leaking valves resulting in odours and noise, as well as from infrequent pollution occurrences of smoke, particulates or other air-borne contaminants caused by such events as plant upsets, equipment malfunctions and adverse weather conditions. Characteristically such emissions are of short duration, and tend to be of a nuisance nature rather than constituting a health risk.

Equipment breakdowns and malfunctions, human error, fugitive sources, unusual meteorological conditions and coincidences of these are facts of life. Although it may be theoretically possible in a technical sense to control any source to such a

degree that incidents will be extremely rare and when they do occur, are of very short duration, this is not always practicable from an economic point of view. The cost of pollution control is not borne by the owner of the sources, but is passed on to society as a whole, or at least that segment that uses the goods and services of the source. Therefore, it may not be in the public interest to have such a high degree of pollution control as to make the spatial relationships of sources and receptors unimportant.

Surveys of residents living near petrochemical industries² indicate that odour is the most offensive perceived aspect of these operations. A survey of Clarkson residents in Oakville showed that 41% felt odours were the worst problem perceived with the operation of a nearby refinery.

It is a general land use planning principle that incompatible land uses should be separated. Furthermore, the MOE recommends separation of incompatible land uses, where necessary, in reviews of land use plans as a preventive means of achieving environmental objectives of The Environmental Protection Act. MOE guidelines specify separation distances to minimize the effects of odours from agricultural operations,⁶ sewage treatment plants or sewage lagoons⁷ from affecting residential uses.

The objective of a buffer zone is to reduce the exposure of humans to nuisance environmental conditions. By restricting new residential development in the buffer zone, the number of persons exposed to nuisance conditions will be minimized. Environmental control measures, such as separation distances between emission sources and residential land uses do not replace, but supplement practicable emission controls.

The absence of any accepted and proven separation distance for situations similar to those found or anticipated in Nanticoke, prompted an investigation of possible methods of defining a buffer zone. Since it is the nuisance to human beings which such

a zone should minimize, it was decided that analysis of complaints in areas of the Province where steel-making operations and oil refineries are located offered a most appropriate technique.

Complaint data for the period 1972-1976 from MOE files were analyzed for seven industrial operations.⁴ Three oil refinery sites examined were: Gulf Oil, Clarkson; Texaco, Port Credit; and Shell-B.P., Burlington. The steel mills examined were: Stelco, Hamilton, Dofasco, Hamilton; and, Algoma, Sault Ste. Marie.

The complainant's location was recorded on a map and the straight line distance between this location and the approximate area of the emission sources was determined. The data was then tabulated and graphed as a percentage of complaints received vs. distance, as expressed in Figures 1 and 2 in the Appendix.

Residential areas were in proximity to all the oil refinery and steel mill sites examined. This contributed to a large number of complaints. The industrial operations studied were generally smaller than those ultimately planned in the undeveloped, primarily agricultural area of Nanticoke. Their age is also important in that it is responsible for some of the problems encountered. Table 1 in the Appendix compares the case study operations and areas with the Nanticoke situation. Total complaints of odour, smoke, dust and other air-borne contaminants (except noise) over the period 1972-1976, ranged from about 40 for the Algoma Steel mill to over 500 for the Gulf Oil refinery.

3. DISCUSSION: DEFINITION OF INDUSTRIAL INFLUENCE AREA (BUFFER ZONE)

A) Selection of a Buffer Zone - Distance

Based upon MOE experience with the oil refinery and steel mill operations examined, a buffer zone where residential use is restricted, would have to be well over 4 km from the emission source to the potential receptors to be 100% effective. This concurs with a 1971 Ontario Government study that recommended a

3 mile (4.8 km) air pollution buffer zone around the major Nanticoke industries.⁸ As these industries are using highly advanced technology and every consideration has been given to their environmental impact on the surrounding area, the buffer zone size could be somewhat reduced and still be effective.

A buffer zone distance of about 3 km would have represented a reduction, on average, of between 70%-80% of complaints around the steel mills and oil refineries, respectively, which is a reasonable level of protection. The source receptor distance of 3 km also corresponds to the average distance at which the number of complaints received in the study areas declines rapidly.⁴ Thus, based on this work, and past experience, a buffer distance of 3 km would seem to provide a practical degree of protection from nuisance emissions without unduly restricting land use.

- RECOMMENDATION: THE NANTICOKE INDUSTRIAL INFLUENCE AREA (BUFFER ZONE) BE APPROXIMATELY 3 KM IN WIDTH WHERE NEW RESIDENTIAL DEVELOPMENT SHOULD NOT BE PERMITTED.

Selection of a Buffer Zone - Shape

An attempt was made to analyze the complaint data for directional bias to test the possible effects of wind direction. The data proved to be inadequate to either support or reject whether such a bias exists. However, climatic data for the Nanticoke area shown in Fig. 3, Appendix, indicates that because there is a sufficient frequency of winds from various directions and a total absence of winds during part of the time, wind direction should not be considered a factor.

- RECOMMENDATION: THE NANTICOKE INDUSTRIAL INFLUENCE AREA SHOULD EXTEND AN EQUAL DISTANCE IN ALL DIRECTIONS FROM ALL EMISSION SOURCES.

Selection of a Buffer Zone - Measurement

It is likely that Stelco will develop up to its western and northern property boundaries by the year 2001 with additional emission sources. Both Texaco and Hydro are permitted to develop up to their property boundaries.

The industrial operations and areas examined in the Province were assessed individually for complaints. They are individually smaller in size (production) than those ultimately planned at Nanticoke. Also, it is not clear what environmental effects could occur by combining different types of major industrial emission sources together at Nanticoke (e.g. oil refining and steel making operations).

In view of these uncertainties, the buffer zone should be measured from the boundaries of the three major industrial components. Map 1 indicates the general size and shape of the 3 km Industrial Influence Area within the City of Nanticoke.

- . RECOMMENDATION: THE NANTICOKE INDUSTRIAL INFLUENCE AREA BE MEASURED FROM THE EXTERIOR BOUNDARIES OF THE STELCO MILL SITE, TEXACO REFINERY, AND HYDRO THERMAL GENERATING STATION. THE STELCO INDUSTRIAL PARK IS TO BE INCLUDED IN THE INDUSTRIAL INFLUENCE ZONE.

B) Permitted Land Uses in Buffer Zone

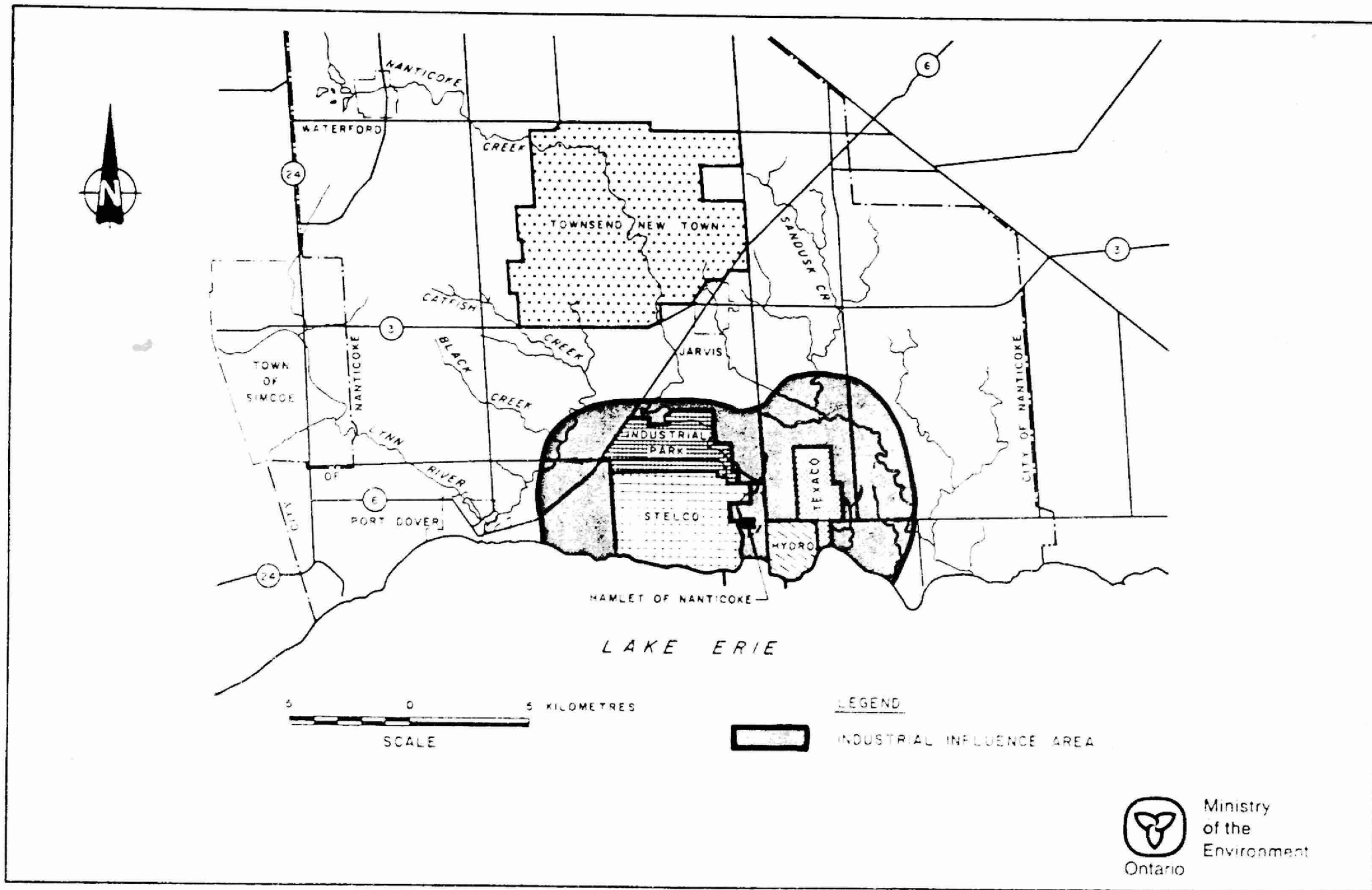
In establishing appropriate land uses for the Industrial Influence Area, it is suggested that acceptable land uses include those which: do not involve long-term residential occupation; do not constitute a large source of air pollution; or, do not result in plume interference.

Compatible land uses include: light, clean industrial, commercial, recreational and open space, and most agricultural uses.

C) Implementation

A programme will be developed for the identification (mapping) of the buffer zone and the formulation of policies for land uses compatible in that zone. The programme will require consultation with the Regional Municipality of Haldimand-Norfolk, the City of Nanticoke, and the Ministry of the Environment. The map and corresponding policies should be part of the District Plan for the City of Nanticoke and be implemented by means of appropriate amendments to the local zoning by-laws.

It is not expected that monitoring from the Nanticoke Environmental Management Program will provide information that would suggest appreciably changing the size or configuration of the buffer zone around the Nanticoke industries in the future. The Regional Municipality of Haldimand-Norfolk should continue to monitor severance activity in the area and infilling in the Hamlet of Nanticoke. The Ministry of the Environment will continue to inventory any residential complaints occurring within the Industrial Influence Area.



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MAP 1 - NANTICOKE INDUSTRIAL INFLUENCE AREA

BIBLIOGRAPHY

1. Chanasyk, V., The Haldimand-Norfolk Environmental Appraisal, Ontario Ministry of Treasury, Economics and Intergovernmental Affairs, Vols. 1, 2, July 1970.
2. Contemporary Research Centre, Clarkson Community Survey, Prepared for Gulf Oil Canada Ltd., August 1975.
3. Government of Ontario, The Environmental Protection Act, Chapter 86, S.O. 1971, (as amended), and Regulation 15 (as revised).
4. Hewings, J.M., Development and Definition of the Nanticoke Industrial Influence Area, Ontario Ministry of the Environment, Air Resources Branch, prepared for the Annual Meeting, Canadian Association of Geographers, Montreal, May 28, 1980.
5. Lusi, N., Air Quality Research and Management in the Long Point, Haldimand, Norfolk Area, Ontario Ministry of the Environment, Air Resources Branch. Presented at a Workshop on Strategies for Environmental Management in the Long Point Area, Waterloo, March 6-8, 1980.
6. Ontario Ministries of Agriculture and Food, Environment, and Housing Agricultural Code of Practice, January 1976.
7. Ontario Ministry of the Environment, Guidelines for Land Use Surrounding Small and Medium-Sized Sewage Treatment Plants, Environmental Approvals Branch, January 1978.
8. Ontario Ministry of Treasury, Economics and Intergovernmental Affairs, Haldimand-Norfolk Study: Threshold of Change 1. Land and Development. A report to the Minister of Municipal Affairs of Ontario, May 1971.
9. Regional Municipality of Haldimand-Norfolk, The Official Plan for the Haldimand-Norfolk Planning Area, June 1979.
10. Veitch, I., Milne, C., Warburton, K. Land Use Compatibility Study: Interpretation of MOE Complaint Data for Land Use Planning. Ontario Ministry of the Environment, Experience '79 Project, June 1980.

A P P E N D I X

Fig. 1

Cumulative Frequency of Percentage of Complaints Versus Distance - Oil Companies

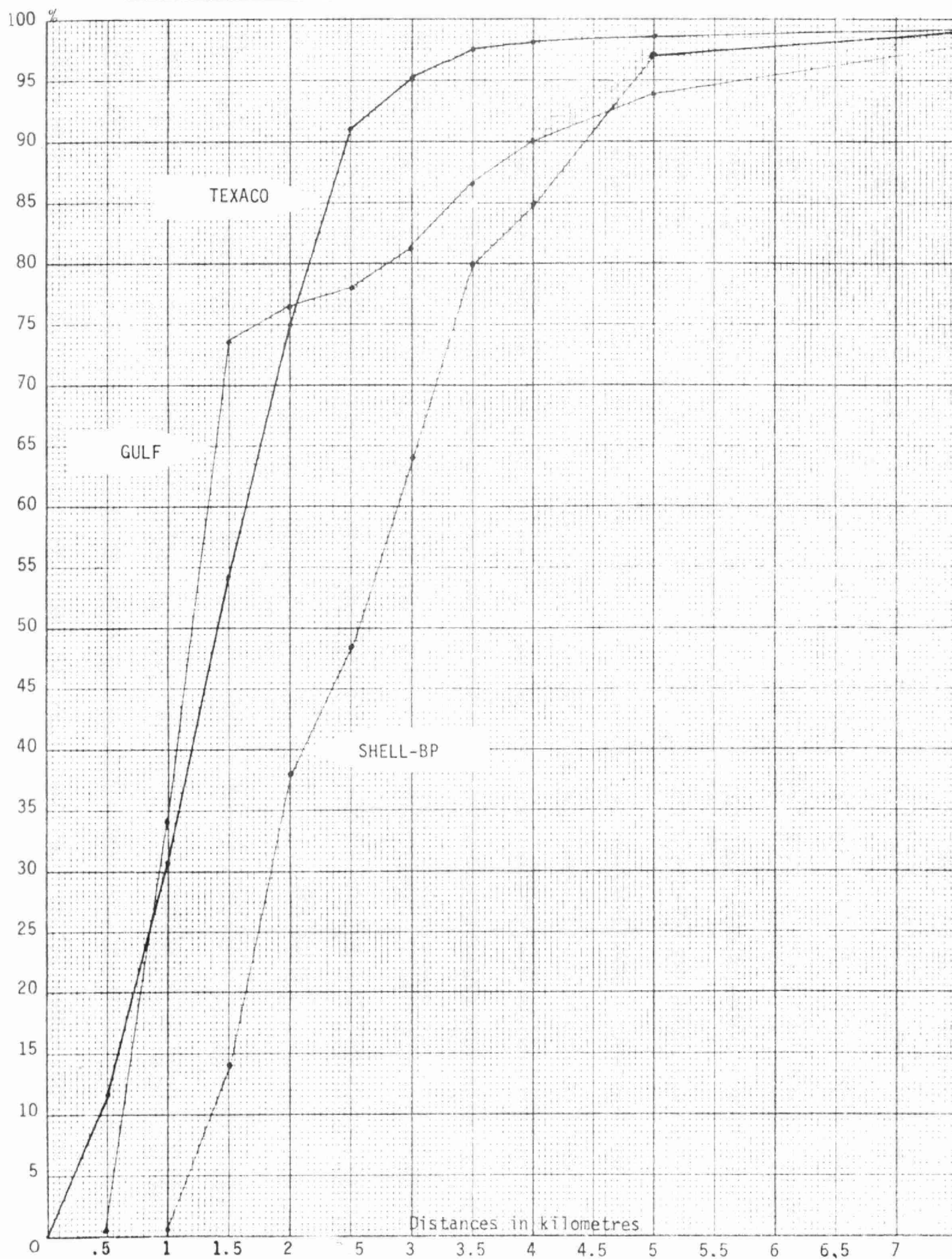


Fig. 2

Cumulative Frequency of Percentage of Complaints Versus Distance - Steel Companies

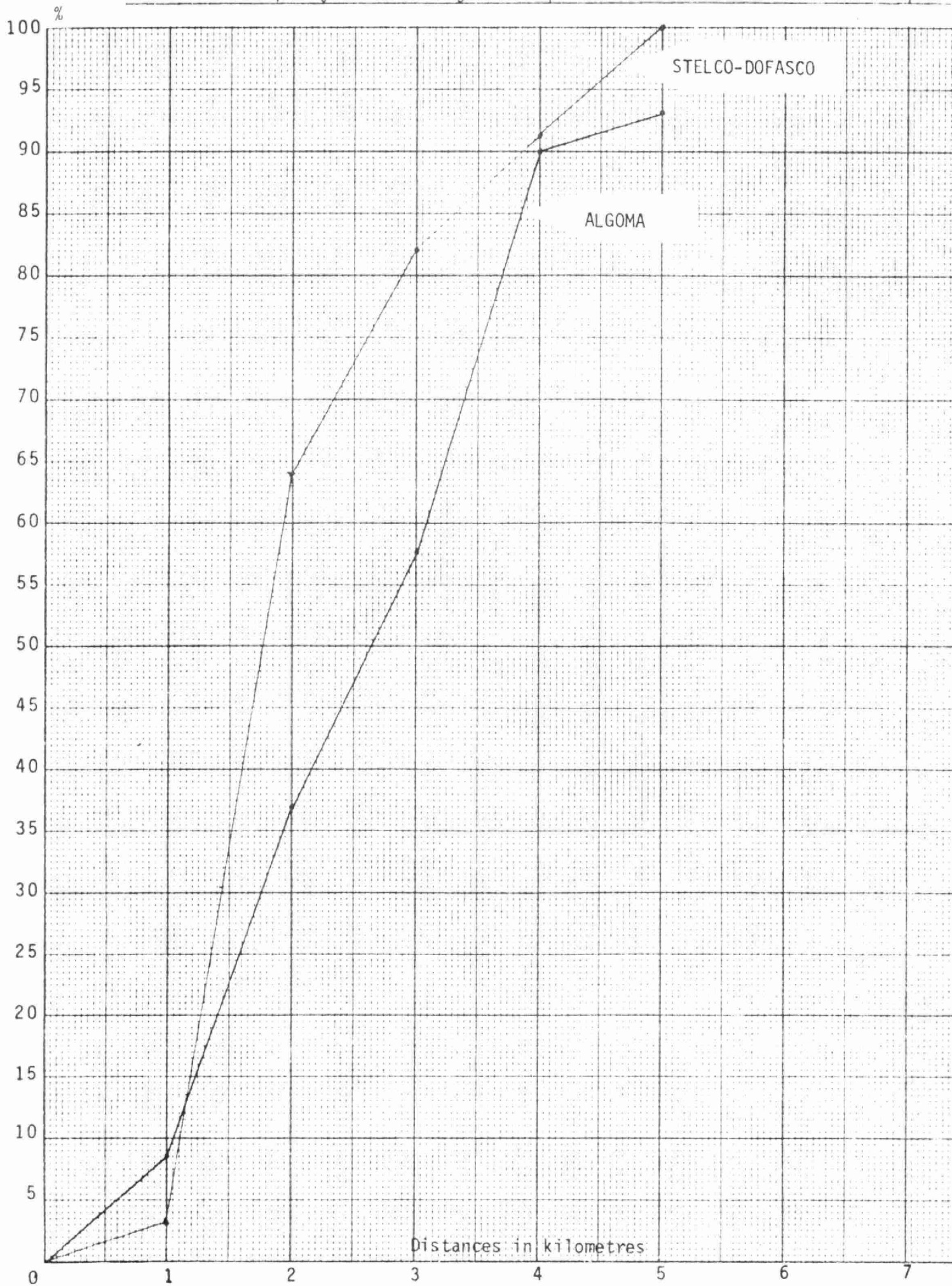
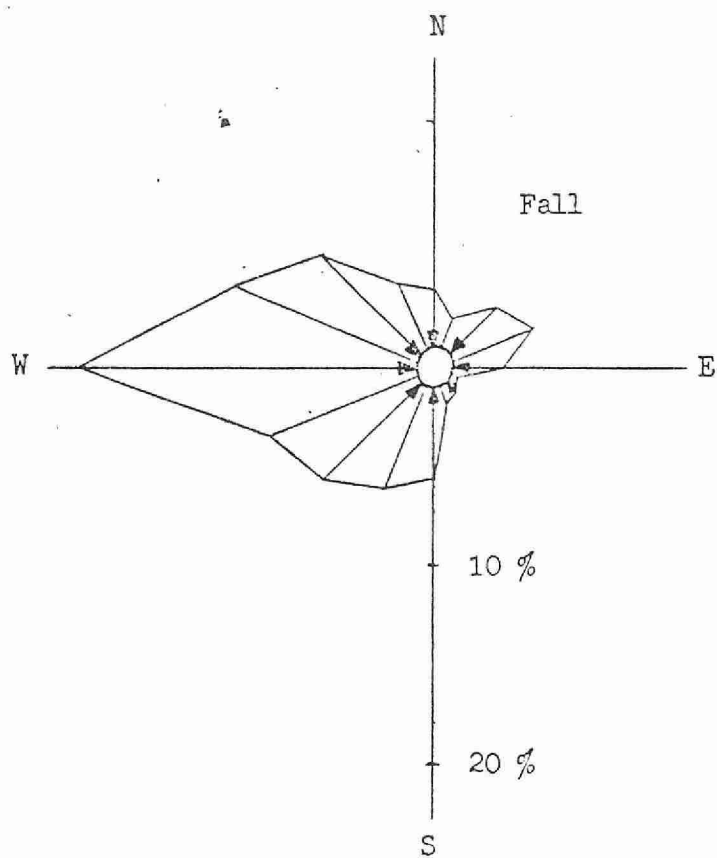
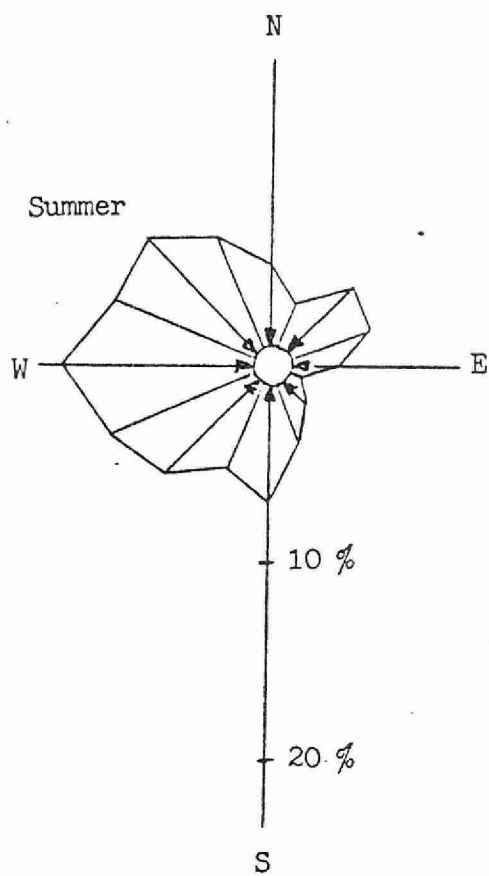
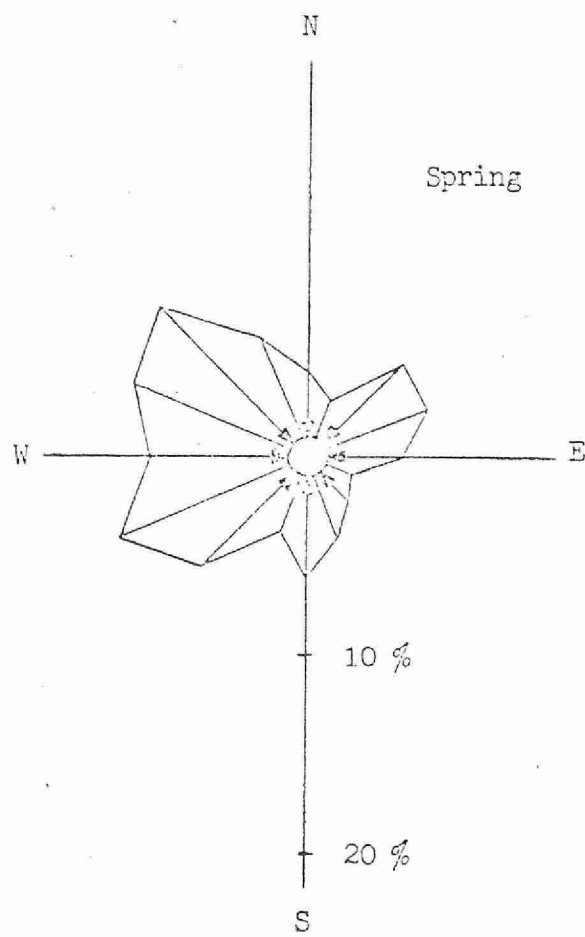
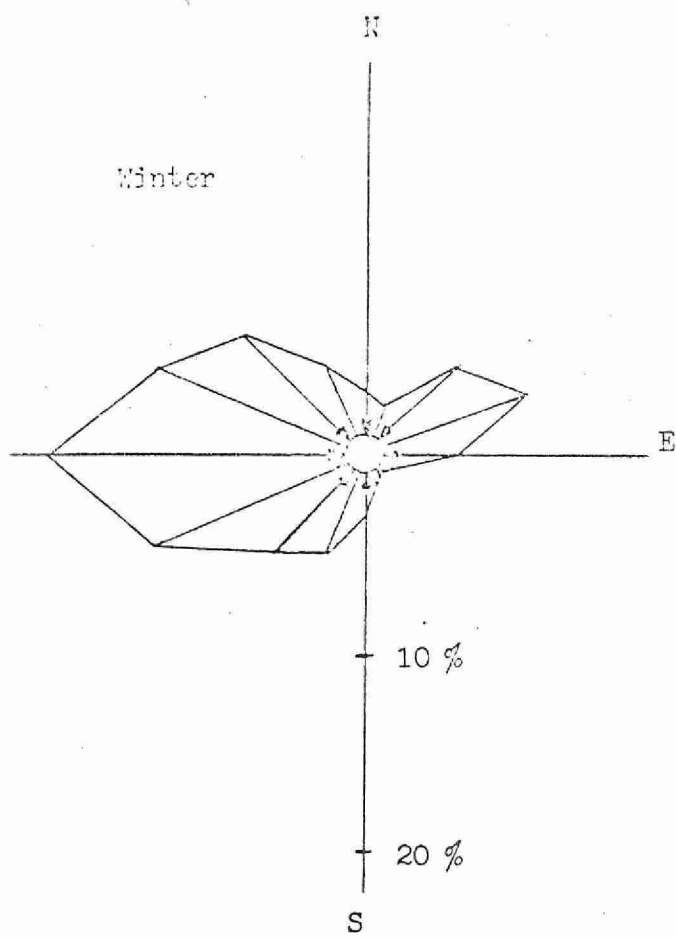


TABLE 1:
COMPARISON OF CASE STUDY OPERATIONS AND AREAS IN ONTARIO
(WHERE COMPLAINTS OCCUR) WITH THE NANTICOKE SITUATION

	Industrial Operation		Surrounding Land Uses			
	Approximate Age of Existing Equipment	Approximate Production Rate	North	East	South	West
<u>Case Studies</u> <u>Steel Mills</u>						
Sault Ste. Marie - Algoma	Early 1950's	4 million tons/yr.	Adjacent Residential Uses	Abitibi Pulp Paper Mill, low-high density residential uses	St. Mary's River	Mill expansion area, port and airport
Hamilton* - Stelco - Dofasco	Early 1950's Early 1950's	5.8 million tons/yr. 4.0 million tons/yr.	Hamilton Harbour	Burlington Beach Residential Area	Residential and other uses	Industry, Cootes Paradise
<u>Oil Refineries</u>						
Oakville - Shell - BP	1963 1959	43,000 b.p.d. 70,000 b.p.d.	CNR tracks, vacant land, QEW	Open Space, Twelve Mile Ck., low-high density residential uses (about 1 km. away)	Shell & BP Parks, test track, low density residential uses, Lake Ontario	Open space, woodlots, some low density residential uses
Mississauga - Gulf - Texaco	Cons. in 1943 Late 1940's	79,000 b.p.d. 48,000 b.p.d.	Adjacent low density residential uses	Adjacent low density residential uses	Lake Ontario	Southdown Road, Industry
Nanticoke - Stelco Steel Mill - Texaco Refinery	Started operation 1980 Started operation 1978	12 million tons/yr. (potential) 95,000 b.p.d. (potential)	Farmsteads and vacant agricultural lands, Nanticoke Ck, Highway 3	Hamlet of Nanticoke Agricultural lands, Sandusk Ck. & Valley	Lake Erie Lake Erie	Agricultural lands, Hwy. 6, Black Ck. Ontario Hydro Generating Station, Hamlet of Nanticoke

* Unusual meteorological conditions can be significant. Presence of the Niagara Escarpment (Hamilton Mt.) to the south-containment of emissions under adverse dispersion conditions (e.g., inversion and/or light NE winds).

FIG. 3: FREQUENCY % WIND ROSE - SIMCOE



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